RIDDLE BRIDGE
East of Route Y at Gasconade River
Dixon Vicinity
Pulaski County
Missouri

HAER No. MO-28

PHOTOGRAPHS

HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Rocky Mountain Regional Office
Department of the Interior
P.O. Box 25287
Denver, Colorado 80225

HISTORIC AMERICAN ENGINEERING RECORD
RIDDLE BRIDGE

I. INTRODUCTION

Location:	Spanning Gasconade River (at the east end of State Route Y) in the Dixon vicinity 6.75 miles northeast of the Pulaski County courthouse (at Waynesville), Missouri.
Quad:	Hancock
UTM:	A 15/4195850N/576260E B 15/4195850N/576330E
Date of Construction:	1911
Present Owner:	Pulaski County Pulaski County Courthouse Waynesville, Missouri
Present Use:	Vehicular bridge to be replaced by a new vehicular bridge. Projected date of removal: late spring 1987. Metal truss being marketed for adaptive reuse.
Significance:	Riddle Bridge is a Pennsylvania (Petit) span with timber stringer approach spans on each end. The metal truss is unique within Missouri because each alternate laced vertical member (numbers 3, 5, 7, and 9) extends only half the distance from the upper chord to the lower chord. A single eyebar is pinned to the end of the half-length laced member; this eyebar continues to a panel point connection at the lower chord. Riddle Bridge was fabricated by the Canton Bridge Company of Canton, Ohio.
Historian:	Mark S. Kross, Archaeologist, Missouri Highway and Transportation Department, April, 1987.

II. HISTORY

A. EARLY BRIDGE CONSTRUCTION IN PULASKI COUNTY

Records available at the Pulaski County Courthouse in Waynesville date from only 1898 [1]. The County Court appointed commissioners to oversee designated county thoroughfares. Additional routes were added to the road system based on needs apparent to the court or else through petitions presented to the court by individuals or groups. Petitions for bridges were also presented to the court for consideration.

Bridges described in the early court records include the following: McCain (also McKane) Bridge spanning the Gasconade River on the Waynesville-Linn Creek Road (Section 34, T36N, R13W) [2]; Fish Dam Bridge spanning the Gasconade River on the Waynesville-Vienna Road (Section 36, T37N, R11W) [3]; and the Crocker-Waynesville Road Bridge crossing the Gasconade River north of Waynesville (Section 14, T36N, R12W) [4].

On May 11, 1907, the court ordered the county surveyor to measure the following locations for proposed bridges: 1. Bear Creek Ford at the Gasconade River (Section 6, T35N, R13W), 2. Ross Ford at the Big Piney River (Section 8, T34N, R10W), and 3. the Wire Road at Roubidoux Creek in Waynesville (Section 24, T36N, R12W) [5]. On May 9, 1908, the court ordered bridges at Ross Ford and Bear Creek Ford [6]; Canton Bridge Company of Canton, Ohio, received the contract for these spans

[7]. The company was also paid $1800.00 from the County Revenue Fund on February 11, 1911, for the bridge spanning Roubidoux Creek at Waynesville [8].

Counties usually let separate contracts for each stage of the bridge construction project. The approach fills and rip-rap were constructed. Then the substructure was built. Approach trestles might be needed. A contract for the fabrication of the wood or metal truss was let. Most of these contracts were let by competitive bidding; at times all bids were rejected. A successful bidder usually put up a bond to cover the proposed costs. A bond was often twice the contract total in the initial years of bridge building. After construction and its approval by the county road and bridge commissioner, the bonds were released and the contractors were paid.

Repairs and maintenance to county bridges were recorded in the county record. The entries in the Pulaski County records were not always specific. Bridges often were not identified. Charges were listed for paint, lumber, freight, and labor.

The construction of bridges was difficult to complete at times. On December 7, 1912, the court ordered that the highway engineer advertise for a bridge across the Gasconade River at Mays Ford (Sections 14 and 22, T36N, R13W) [9]. This was to be done if petitioners deposited $1000.00 to the engineer's credit at the bank and if they provided free right-of-way. On February 4, 1913, the court ordered advertisement for a steel bridge at Mays Ford; the bids were to be opened on

February 27 [10]. On February 29 the bids were opened. Canton Bridge Company had the lowest and best bid ($7900.00), and the county engineer was ordered to enter into a contract [11]. Apparently this was not done because on May 7, 1913, the court was presented a petition for a wagon bridge at Mays Ford and $8000.00 was set aside. The petition called for a 177-foot span and an 80-foot span fourteen feet wide on tubular piers with a 144-foot wood approach [12]. Again the county engineer was ordered to advertise for the bridge. Within a week action on this order was tabled by the court. On August 14, 1913, an injunction relating to the wagon bridge at Mays Ford was tabled until the next regular term [13]. This injunction was continued until January 1, 1914. Another petition was filed on May 4, 1914, for a wagon bridge at Mays Ford [14] and also again on May 15, 1914 [15]. The court again ordered that a bridge be built; this bridge was to be of two 119-foot spans with three piers. The county engineer was ordered to advertise for the contract. On June 12, 1914, Canton Bridge Company submitted a low and best bid of $6875.00 [16]. The bridge presently at Mays Ford is a modified concrete arch and I-beam span unlike any of the steel spans mentioned. The court records indicate that the completion of a bridge at Mays Ford was no easy administrative task.

Beginning in 1915 contracts were let for smaller concrete culverts throughout the county. After 1917 state aid roads and improvements were described in the court records. On May 11, 1918, the county applied for state aid for a designated state road intersecting Vienna, Dixon, Crocker, and Richland and also a road between Iberia, Crocker,

Waynesville, and Houston [17]. In July, 1918, the county applied for state aid to build thirty miles of the "old Wire Road" for $800.00 per mile for grading and culverts [18]. On December 26, 1919, the court record indicated that a $250,000.00 Road and Bridge bond issue passed by 1557 to 251 votes [19]. The court record dated July 20, 1920, listed an estimated appropriation of $34,375.00 per mile for a state and federal aid road project on the St. Louis and Springfield Road; this included a 250 foot bridge over the Big Piney River [20]. Later, major road improvements within the county generally were handled by state and federal agencies.

B. CONSTRUCTION CHRONOLOGY

On February 6, 1911, the Pulaski County Court ordered the county highway engineer (A.G. Williams) to advertise for bids for construction of a one-span steel bridge over the Gasconade River at or near a ford known as Riddle Ford [21]. The engineer was to report said bids to the county court on February 25. Apparently Canton Bridge Company of Canton, Ohio was the successful bidder, but no recorded entry notes this in the court records.

The next entry regarding Riddle Bridge was on November 10, 1911. The county court ordered the clerk to issue a warrant for $3348.00 to Canton Bridge Company payable out of the County Foreign Insurance Fund [22]. On February 7, 1912, the court record indicated that Mr. F.W. Hoover, agent for the Canton Bridge Company was issued warrants payable from the following accounts: $440.00 out of the Sinking Fund;

$1368.00 out of the Back Tax Fund; $900.00 out of the County Revenue Fund; and $640.00 out of the County Foreign Insurance Fund [23]. The figures presented indicate that the possible total cost for Riddle Bridge for the steel truss itself was $6696.00.

The court records fail to mention any contracts for approach spans, trestles, or fills for Riddle Bridge. No bridge inspections or bridge engineer reports are recorded. The only other entry in the records which specifically describes Riddle Bridge was made on November 8, 1913. John Riddle and C.E. George were each paid $11.25 from the Road Fund for labor on the bridge [24]. Records after this date mention expenditures for general repairs and materials for unspecified bridges.

C. LOCATION

Riddle Bridge was built across the Gasconade River near a ford known as the Riddle Ford. The ford was on a travelway leading from Dixon south to St. Robert and Waynesville. The crossing was impassible during times when the river flooded.

The area was and has been rural with an agricultural economy since it was settled by Euro-Americans in the 1830's. One of the families in the area from that date was the Riddle family. Apparently the bridge was built upon land owned by Elias Riddle [25]; he died in 1891. However the ford and later the bridge acquired his name.

The setting of Riddle Bridge is much as it likely was when it was built in 1911. The Conservation Commission of Missouri has acquired about nine acres of land north of the west end of Riddle Bridge where they have established a graveled parking lot and a paved boat ramp into the river.

III. THE BRIDGE

A. DESCRIPTION

Riddle Bridge is a twelve (12) panel pin-connected Pennsylvania high through truss. It has three timber stringer approach spans on the west end of the truss span and two on the east. The truss span is 216 feet long; with the approach spans the bridge is 296 feet long. It is 13.8 feet wide (curb to curb) and 12.9 feet high (vertical clearance over deck).

The bridge has diagonal members in tension and vertical members in compression, except for the hip vertical adjacent to the inclined end posts. Eyebars are used for the tension members. Rods are used for the top lateral bracing and the bottom lateral bracing. Eyebars are used at each alternate vertical member (Numbers 3, 5, 7, and 9), but these extend only half the distance from the lower chord to the upper chord. Diagonal members are two eyebars that cross two panels intersecting the end of each half length member. The vertical compression members, inclined end posts, and top chords are made of laced channel steel, except for the alternate vertical members noted above. At

those members laced channel steel extends halfway down the panel from the upper chord where it is then pinned to an eyebar. This indicates that these members are not compression members but ones in tension. Rod subties are pinned to either the top or bottom chord and the half-length members. Reinforced rolled steel is riveted to the upper side of the inclined end posts and the top chords. The upper struts, sway bracing, portals, and floor beams are channel steel. The sway bracing connects the full length vertical members (Numbers 2, 4, 6, 8, and 10). The lower chords are eyebars pinned to the verticals. The floor beams are attached to the pins through an assembly riveted to those beams. No horizontal members cross the panels to strengthen the truss.

The bridge has no metal ornamentation other than steel bands riveted to form X's on the portal struts. Four of these X's flank each side of the bridge plates at each end of the bridge. These X's are characteristic of bridges built by the Canton Bridge Company. Photos dating from 1979 show bridge plates at the portals. These pentagonal plates read as follows:

1911
THE CANTON BRIDGE Co.
BUILDERS
CANTON, OHIO

Both bridge plates are now missing.

The bridge deck is made of rough sawn timber planks of various dimensions. They are laid from curb to curb on their broader side. The

deck is nailed to eight plank stringers set on end upon the floor beams.

The truss is set upon concrete piers encased in steel caissons. The pier columns on each end are tied together with steel rods and channel steel. The piers have deteriorated as rivets of the encasing steel have popped and as the concrete has crumbled. The bearing on the west end of the truss is fixed. On the east end it is a roller apparatus which handles expansion and contraction.

The approach spans have substructures made of treated timber pilings. On the west, the pilings have been reinforced with I-beams embedded in concrete which are bolted to the timbers. The timber substructure of the eastern approach spans are bolted to I-beams driven into the ground. The abutments at the ends of both approach spans are made of poured concrete. These abutments are apparently not the original ones from 1911 because broken concrete is strewn upon both banks in the proximity of the newer abutments.

Foundries which supplied steel for the bridge included Cambria and also Jones and Laughlin. These names are stamped on various members of the truss. Numbers have been stamped on certain steel members. The number "1351" is on some of the eyebar vertical members pinned to laced half-vertical members. Some of the diagonal eyebars also have "1351" on them. Several of the eyebars on the lower chord are stamped with both "345" and "1351". Other lower chord eyebars are stamped with either "123" and "1351" or "567" and "1351". Several of the diag-

onal eyebars extending across the panels have both "23" and "1351". These are likely part numbers for bridge members which were stamped by the fabricator. Because "1351" is visible on all members with numbers, it might refer to one type of bridge - a Pennsylvania high through truss. The other numbers are probably those specified for each particular member. The numbers were likely used for parts lists, shipping lists, and assembly diagrams.

B. MODIFICATIONS

Riddle Bridge appears much as it likely did after it was built in 1911. The bridge deck has been replaced periodically. The metal truss was repainted in the past, although it is now rusty. Bent vertical members on both sides of the bridge, located between the second and third panels from the western end, have been strengthened with cable stays stretching from the upper panel point connection at the portal to the vertical member at the lower connection of the sway bracing.

Woven steel guard cables have been added to the bridge. They are connected either to 2.5-foot steel channel members attached to the lower panel point connections at specific vertical members (1, 3, 5, 7, 9, 11) or else to the laced channel iron vertical members. An old photograph of Riddle Bridge from the 1920's showed a wooden guard rail.

Modifications have been made at the approach spans to strengthen them. An unconfirmed report indicated that the western approach span had collapsed under a loaded truck in the 1960's or 1970's.

C. OWNERSHIP AND FUTURE

Riddle Bridge has been owned and maintained by Pulaski County since its construction. The county bridge inventory route number is 98 and the inventory bridge number is 098000.2. A structural appraisal of Riddle Bridge revealed that it is structurally deficient and functionally obsolete. The steel truss is covered with rust and it has suffered collision damage. The concrete and steel piers are deteriorating as is the wooden deck. The width is insufficient to handle certain traffic. Because of its condition a decision was made to replace the bridge.

The new bridge is being built immediately downstream. It was proposed to leave Riddle Bridge in place and closed to traffic. However, the bridge, if washed out by a flood, would have threatened the new span downstream.

The availability of Riddle Bridge has been advertised nationally. Over twenty requests for information have been received. Interest has come from parties within Missouri and as far as California and Vermont. Proposals for re-erection of Riddle Bridge will be reviewed by the Missouri State Historic Preservation Officer, the Federal Highway Administration, and the Missouri Highway and Transportation Depart-

ment. If a party is selected to assume ownership of Riddle Bridge, the metal truss will be matchmarked and disassembled for transport elsewhere. Re-assembly will be in a manner and for a use appropriate to its historic character. If no parties are willing to take and re-assemble Riddle Bridge, it will be demolished.

IV. BIOGRAPHICAL MATERIAL

A. THE CANTON BRIDGE COMPANY

The Canton Bridge Company was located in Canton, Ohio. The company, apparently formed in 1876 [26], was incorporated in 1891 and its products included bridges, turntables, and iron work. Massillon Steel Joist Co. (Ohio) bought the Canton Bridge Co. in 1925. Although these companies operated separately for four years, they merged and formed the Macomber Steel Company [27]. The Canton Bridge Company supplied an uncalculated number of bridges across the State of Missouri. At least four others were constructed by the firm within Pulaski County according to the county records. The annual operating capacity of the company in 1894, 1896, and 1898 was 3500 long tons in each year; the annual capacity in 1903 was 5000 long tons [28].

V. ENDNOTES

1. Proceedings of the Pulaski County Court, Book D (November 7, 1898 to November 26, 1902).
2. Proceedings, Book D, p. 5.

3. Ibid., Book O, p. 38.

4. Ibid., Book E, p. 75.

5. Ibid., Book F, p. 55.

6. Ibid., Book F, p. 237.

7. Ibid., Book F, pp. 358-9, 398, 408.

8. Ibid., Book G, p. 97.

9. Ibid., Book G, p. 423.

10. Ibid., Book G, p. 430.

11. Ibid., Book G, p. 460.

12. Ibid., Book G, pp. 486-7.

13. Ibid., Book G, p. 524.

14. Ibid., Book H, p. 13.

15. Ibid., Book H, pp. 44-49.

16. Ibid., Book H, p. 53.

17. Ibid., Book I, p. 323.

18. Ibid., Book I, p. 352.

19. Ibid., Book J, p. 125.

20. Ibid., Book J, p. 374.

21. Ibid., Book G, p. 99.

22. Ibid., Book G, p. 219.

23. Ibid., Book G, pp. 250-1.

24. Ibid., Book G, p. 585.

25. "Old Settlers Gazette", Issue No. 4, July 26, 1986, published by KJPW Radio, p. 37.

26. Darnell, Victor A., "Directory of American Bridge - Building Companies 1840-1900." Society for Industrial Archaeology Occasional Publication No. 4, Washington, D.C., 1984, p. 48.

27. The Ohio Historic Bridge Inventory, Evaluation, and Preservation Plan. Published by the Ohio Department of Transportation in cooperation with the Federal Highway Administration, 1983. p. 222.

28. Op. cit., Darnell, p. 79.